

MADAGASCAR. Fianarantsoa Prov., on granite 25 km. NW of Fianarantsoa, Alt. 1300 m., coll. G. Fievet, cult. Mbabane, Swaziland, fl. 10 June 1965, Reynolds 11619 holotype (PRE), isotype (K).

This remarkable species was discovered by Mr. Gerard Fievet of Fianarantsoa. Plants were sent by him to Mbabane, Swaziland, where some of them flowered in June 1965.

A. cryptoflora was so named because, when in full bloom, the flowers are hidden by their large fleshy somewhat rounded, as if cupped, bracts, only the mouth of the flower and the exerted orange anthers being visible.

In shape and size of the deep green leaves *A. cryptoflora* is nearest allied to *A. fievetii* but is nothing like it in floral characters. With its 10 mm.-long sessile flowers and densely flowered cylindric racemes (but not in leaves) *A. cryptoflora* is closely allied to *A. conifera* H. Perr. but the latter has a more compact rosette of bluish-grey leaves.

The bracts of *A. cryptoflora* are remarkably thick, fleshy, orbicular-cuspidate, and are somewhat cupped around the flower which it touches with the base, apex and margins of the bract. There is a distinct space between the middle of the bract and the perianth.

As is usual with racemes of this kind, the flowers open first up the sunny side of the raceme.

DESCRIPTION. *Plant* succulent, solitary, acaulous or with a short stem.

Leaves 15—20, densely rosulate with slight spiral twist, lanceolate-attenuate, spreading, 20—25 cm. long, 6.5 cm. broad; *upper surface* deep-green with slight reddish tinge, rather flat, without spots or markings; *lower surface* convex, otherwise as the upper surface; *margins* with continuous brownish-red edge armed with teeth of the same colour that are deltoid, 2—3 mm. long, 5—10 mm. apart.

Inflorescence usually 1-branched, 40 cm. high, sometimes 60 cm. in the wild state.

Peduncle reddish-brown, basally plano-convex and 15 mm. broad, with one short branch from about the middle, with a few sterile-bracts above the base of the branch that are broadly ovate-cuspidate, thick and fleshy, the lowest about 12—15 mm. long and broad, 7—9-nerved.

Racemes cylindric, very slightly conic, the terminal 14 cm. long, 3 cm. diam., the lateral only half as long, very densely many-flowered, all buds at first hidden by densely imbricate bracts.

Bracts broadly ovate-orbicular-cuspidate, rounded and somewhat cupped, thick, fleshy, pale-green, 11 mm. long, 12 mm. broad when pressed flat, 7—9-nerved, the nerves greenish.

Pedicels none.

Perianth cylindric-campanulate, slightly trigonous, 10 mm. long, 3·5 mm. diam. across the ovary, greenish-yellow low down, orange-yellow at the mouth; *outer segments* free to base, obscurely 3—5-nerved; *inner segments* broader than the outer, with one median nerve.

Filaments lemon, the 3 inner narrower and lengthening before the 3 outer with their *anthers* in turn exerted 2—3 mm. *Stigma* at length exerted 3 mm. *Ovary* pale-green, 4 mm. long, 2 mm. diam.

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STUDIES IN CYPERACEAE IN SOUTHERN AFRICA: II

Review of the tribe Scirpeae and History of the genus *Fimbristylis* Vahl

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ABSTRACT

The tribe Scirpeae is reviewed with particular reference to interpretation of floral structure as simple, or specialised, within Cyperaceae. A plea for classification based on more attributes than have been employed in the past, is made. A history of the genus *Fimbristylis* Vahl is given.

INTRODUCTION

It has been accepted by many that Cyperaceae is a family allied to, but less highly advanced than, Gramineae together with which it has possibly been derived by parallel evolution from Liliaceous ancestors through the Juncaceous complex (Hutchinson, 1959).

Within Cyperaceae classification is by no means uniform, but it is generally accepted that there are a number of main spikelet and flower forms represented. These structural lines have been accorded tribal rank by the majority of workers. Thus Bentham (1887) recognised six such units, Holttum (1948) five and Hutchinson (l.c.) seven.

It has also been common practice to group the tribes into categories of higher hierarchal level in order to represent what have been regarded as the main lines of evolutionary development. Within these, by the positioning of the tribes, possible phylogenetic relationships were suggested. Thus Bentham (l.c.) grouped his six tribes into two series, Monoclines and Diclines. Clarke (1908) recognised four sub-orders, within the first of which, Scirpo-Schoeneae, he placed four tribes, one of which was Scirpeae. Mattfeld (1936) recognised three sub-families, while Hutchinson (l.c.) by failure to recognise such rank, indicated his seven tribes as representing distinct evolutionary lines.

Inherent in much of this classification has been the concept that the unisexual floret, such as occurs in *Carex*, is specialised and derived by reduction from bisexual flowers such as typify *Scirpus*.

On this basis the tribe Scirpeae, or the sub-family Scirpoideae, has been often regarded as the most primitive floral condition within Cyperaceae and representative of the probable stock from which other spikelet and flower forms were derived.

Comparatively recently, however, chiefly as the outcome of investigation of tropical genera by a number of workers, considerable doubt has been cast on this interpretation of relationships within the family. Mattfeld, (1938) who based his observations on *Dulichium* Pers., was probably the first to discuss the derivation of bisexual from unisexual flowers.

Subsequently Blaser, (1940) who attempted an interpretation of cyperaceous phylogeny based on the nature of the vascular supply to both spikelet and inflorescence, obtained evidence which suggested that, "the taxonomic spikelets of the Scirpineae and Lipocarphineae (following Pax, 1889) are, morphologically, contracted major branches, so that each flower represents a 'spikelet'." Thus he, too, could not support the interpretation of the scirpaceous spikelet as "simple".

Holtum (1948) reaffirmed Bentham's (1877) views regarding homology between the spikelets of Hypolytreae and *Scirpus* and went on to suggest derivation of the latter from the former by reduction; an hypothesis in keeping with the tropical forest environment favoured by most representatives of Hypolytreae. Holtum did not, however, pursue his thesis throughout Cyperaceae, for he proceeded to suggest development of the varied genera comprising Rhynchosporae along a series of different lines all from the bisexual state in *Scirpus*. From the Rhynchosporae he derived, again by reduction, the unisexual tribes Cryptangieae, Sclerieae and Cariceae, thus following, in part, the old concept of development of unisexual from bisexual floral types.

To this part of Holtum's paper Kern (1962) has raised serious objections, at the same time enthusiastically supporting the Mattfeld-Holtum concept of the possible development within Cyperaceae of bisexual from unisexual flowers. Kern goes as far as to maintain that if floral structure among the sedges is considered from this more recently proposed aspect, the family becomes so natural a unit that, "subdivision into sub-families is hardly, if at all, justified". He also avers that if the newer interpretation is proved correct, "a derivation (of Cyperaceae) from Liliiflorae, especially Juncaceae, is impossible."

Such diametrically opposed interpretations of evolutionary development must surely prove a stimulus to modern workers within the family. Especially must this be the case for those in the tropics and in areas where undescribed species are likely to be encountered. Not only must observation of floral form by such workers be meticulously accurate, but interpretation must be undertaken with an open mind. More important still is the need to obtain data from aspects additional to that of floral form in order to provide a further appreciation of natural relationships, which will provide a broader basis for classification than that which pertains at present and from which, eventually, phylogenetic lines may possibly be more correctly deduced.

In studying Southern African Cyperaceae, the tribe Scirpeae, because of its controversial evolutionary position and numerous representatives, was considered a good starting point.

REVIEW OF THE TRIBE SCIRPEAE

The tribe Scirpeae can be said to include all sedges with an apparently simple spikelet construction consisting of a central rachilla bearing an indefinite number of spirally, or partly distichously, arranged glumes each of which carries in its axil a single hermaphrodite flower. Occasional exceptions occur when the basal one or two glumes of a spikelet are sterile. Towards the apex of the spikelet the florets of the uppermost glumes, probably as the result of lack of vigour, sometimes fail to produce stamens and so appear unisexual.

Despite this rather clear cut definition, it is perhaps not surprising in view of opposed morphological interpretations of the scirpaceous spikelet, to find that the limits of the tribe differ from one author to another, depending partly upon the morphological interpretation followed and partly upon the emphasis given to characters used in classification.

In treating South African Cyperaceae, Clarke (1898) and following him Phillips, (1926) include *Lipocarpha* R. Br. and *Ascolepis* Steud. within Scirpeae. On the other hand Schonland, (1922) probably following Pax (1889), excludes these taxa, and includes only *Scirpus* L., *Eleocharis* R. Br., *Fimbristylis* Vahl, *Bulbostylis* Kunth, *Ficinia* Schrad. and *Fuirena* Rottb.

These are the genera most commonly included in the tribe, but there is no guarantee of the correctness of the relationships implied by such classification. Already there is doubt regarding the inclusion of *Fuirena* in this plexus, for Kern (1962) has stated that from his observations, which he points out need the corroboration of evidence from anatomical investigation, the scales are within rather than without, the stamens.

Confirmation of Kern's observation is not afforded by the work of Blaser, (1941) who investigated by serial sectioning development of vascular supply and floral organs in *Fuirena hispida* Ell.

It is unwise, however, to be definite on evidence derived from study of a single species only. Examination of all representative types within the genus is essential before Kern's observations can be disregarded. If they prove correct, then the affinities of *Fuirena* must be reconsidered, for they probably do not lie with Scirpeae.

Other genera of this tribe need re-consideration. Kern (l.c.) suggests the disc under the nut in *Scleria* might perhaps be, not a vestigial perianth, but a utricle, homologous with that of *Bisboeckelera* O. Ktze. What of the disc in *Ficinia* that is sometimes poorly developed in some species of *Scirpus*? *Scirpus* itself needs further detailed study, for generic limits are not clearly defined nor stable, and in the course of its history transference of many species within

and without the taxon, sometimes without fundamental morphological supporting evidence, has taken place.

The difficulty in defining limits to *Scirpus* applies again with other genera. Species of *Fimbristylis* are difficult to differentiate from *Bulbostylis* species; *Eleocharis* from *Scirpus*; *Ficinia* from *Fimbristylis* and *Scirpus*.

Clearly a new approach is necessary. The characters upon which classification has been based in the past are unsatisfactory, being in particular too few. Thus the distinction between *Bulbostylis* and *Fimbristylis* really depends only upon the persistence, or not, of the style base on the achene. What of species in which the style base persists for a short period only, to fall eventually?

Classification on the basis of as many attributes as possible must be carried out if a clearer understanding of relationships within the family is to be gained. At present, modifications must of necessity be based predominantly on morphological characters, vegetative and floral, since information from other aspects of study is largely lacking.

The little work that has so far been carried out on the chromosomes of Indian and African species suggests that this aspect of study may add valuable information to that derived from morphology, for Sharma and Bal (1956) found the chromosome type in *Fimbristylis* to differ from that in *Scirpus*. On these grounds they advocated the removal of one or other genus from Scirpeae. Such radical changes cannot be undertaken until a body of knowledge from many different aspects of study is available for integration and consideration. Nor must radical changes be undertaken until knowledge of species on a world basis is available. To this end, detailed investigation by individual workers in different areas can contribute materially to the whole appreciation of relationships within Cyperaceae.

As a starting point within Scirpeae investigation of *Fimbristylis* was commenced. This genus was selected since its limits, apart from relationship with *Bulbostylis*, are fairly clearly defined. In addition some of its species are pantropic in distribution and therefore of significance to others outside Africa. Lastly its morphological structure seemed reasonably constant.

HISTORY OF THE GENUS *FIMBRISTYLIS* VAHL

Type species: *F. dichotoma* (L.) Vahl

The genus *Fimbristylis* was first established by Vahl (1806) who gave this name to a taxon he characterised by the brief description, "Squamae palaeaceae undique imbricatae. Cor. O. Stylus 2-fidus, basi bulbosus, compressus, margine ciliatus. Set. O."

The genus should thus, according to Vahl, accomodate only species with all glumes imbricate and with compressed, ciliate margined, basally expanded

two-branched styles. No mention was made of achene nor of inflorescence form, but in the light of present knowledge, it is safe to assume that the type species having two-branched styles, also had lenticular nuts. The inflorescence must have been compound, of "umbellate" form, comprising approximately from twenty to one hundred laxly arranged spikelets.

Fimbristylis was thus, as originally defined, a homogeneous "natural" taxon. Species exhibiting this basic structure except for slight, apparently constant differences were regarded as representing distinct, yet closely allied genera.

Thus about the time at which Vahl described *Fimbristylis*, the following taxa were also established.

Abildgaardia Vahl (1806)—basal glumes to spikelet distichous, not spiral;

Isolepis R. Br. (1810)—inflorescence of one spikelet only;

Trichelostylis Lestib. (1819)—style 3-branched; nut 3-angled;

Pogonostylis Bertol. (1833)—style base with long pendant hairs overhanging nut.

In the latter half of the nineteenth century, with acceptance of the evolutionary outlook and the possibility of natural variation within species, established generic limits were scrutinised to determine whether these might be regarded as of phylogenetic significance, or whether they were of purely systematic value and so "artificial".

This scrutiny resulted in eventual sinking in *Fimbristylis* of all the genera mentioned above, as well as of others. Boeckeler, (1869–1870) who was finally responsible for appreciating the artificiality of R. Brown's *Isolepis*, included all *Isolepis* names known to him in other genera of Cyperaceae. Thus the four hundred and seventy synonyms established in *Isolepis* were referred to eighteen genera, the vast majority to *Scirpus*, but sixty-two to *Fimbristylis* (Beetle, 1945).

Thus during the first one hundred and fifty years of its history, the limits applied to *Fimbristylis* by Vahl were widened until, today, species with partially distichous, partially imbricate glumes; with three-branched styles and trigonous achenes; with long hairs pendant from the style base and partially masking the nut; with inflorescences of solitary spikelets terminal on the flowering stems are all included by the majority of systematists. Whether this interpretation will be maintained in the light of modern cytotaxonomic work and evidence from other fields of study will be interesting to determine. There are, of course, still the workers who maintain some of these "genera". Thus Robyns and Tournay (1955) maintain *Abildgaardia*, including in it *A. monostachya* (L.) Vahl = [*F. monostachya* (L.) Hassk.]

Pax (1889) recognised five sections within *Fimbristylis*, namely:

Heleocharoides (=genus *Mischospora* Boeck.)—spikelets solitary on the flowering stem;